

REMARKS:

This application has been carefully reviewed in light of the Office Action dated May 17, 2006. Claims 1 to 9, 11, 12, 14, 15 and 21 to 27 remain in the application, with Claims 10, 13 and 16 to 20 having previously been cancelled, and Claims 1 and 22 having been amended herein. Claims 1, 22 and 26 are the independent claims currently under consideration. Reconsideration and further examination are respectfully requested.

Initially, Applicants thank the Examiner for the indication that Claims 26 and 27 are allowed, and that Claim 21 contains allowable subject matter and would be allowable if rewritten in independent form. Applicants have not rewritten Claim 21 in independent form at this time since all of the claims in the Application are believed to be in a condition for allowance, as discussed below.

Claims 1 and 22 have been amended herein to further clarify the invention. Support for amended Claims 1 and 22 can be found throughout the specification, particularly in paragraph [0024]. No new matter is believed to have been added with these amendments.

Claims 1, 12 and 22 were rejected under 35 U.S.C. § 103(a) over U.S. Patent No. 3,489,203 (“Fischell”) in view of either U.S. Patent No. 6,017,013 (“Simonian”) or U.S. Patent No. 3,540,688 (“Schulte”); Claims 2, 3 and 9 were rejected under 35 U.S.C. § 103(a) over Fischell in view of either Simonian or Schulte and further in view of allegedly admitted prior art (“AAPA”) in paragraph 26 of the specification; Claims 4 to 8, 14, 23 and 24 were rejected under 35 U.S.C. § 103(a) over Fischell in view of either Simonian or Schulte and AAPA and further in view of U.S. Patent No. 6,164,077 (“Feger”); Claim 11 was rejected under 35 U.S.C. § 103(a) over Fischell in view of either Simonian or Schulte and further in view of U.S. Patent No. 6,073,888 (“Gelon”); and Claims 15 and 25 were rejected under 35 U.S.C. § 103(a) over Fischell in view of either Simonian or Schulte and further in view of U.S. Patent No. 5,823,476 (“Caplin”). Reconsideration and withdrawal of these rejections are respectfully requested.

The present invention generally concerns a thermal control system for a spacecraft. With reference to the particular claim language, independent Claim 1 is directed to a thermal control system for a spacecraft, the spacecraft being characterized in part by a spacecraft bus supporting at least one instrument tending to generate heat, and one or more spacecraft thermal radiator panels spatially separated and kinematically isolated from the at least one instrument. The thermal control system includes at least one active cooler tending to generate vibrations, the at

least one active cooler being mounted or for being mounted to the spacecraft at a location spatially separated and kinematically isolated from the at least one instrument. The thermal control system further includes at least one kinematic mount for kinematically isolating the at least one active cooler from the at least one instrument. The at least one active cooler is thermally coupled between the at least one instrument and the one or more spacecraft thermal radiator panels or is for thermally coupling the at least one instrument and the one or more spacecraft thermal radiator panels. The at least one active cooler is for transferring heat from the at least one instrument to the one or more spacecraft thermal radiator panels.

Independent Claim 22 is directed to a system including an instrument platform, at least one instrument mounted on the instrument platform, the at least one instrument tending to generate heat, and at least one thermal radiator mounted at a location spatially separated and kinematically isolated from the at least one instrument. The system further includes at least one active cooler tending to generate vibrations, the at least one active cooler being mounted at a location spatially separated and kinematically isolated from the at least one instrument, a thermal link thermally coupled between the at least one active cooler and the at least one instrument, and at least one kinematic mount for kinematically isolating the at least one active cooler from the at least one instrument. The at least one active cooler is for transferring heat from the at least one instrument to the at least one thermal radiator.

The applied references are not seen to disclose or suggest the features of independent Claims 1 and 22, particularly with respect to at least the features of (i) at least one active cooler tending to generate vibrations, (ii) at least one kinematic mount for kinematically isolating the at least one active cooler from the at least one instrument and (iii) the at least one active cooler mounted or for being mounted at a location spatially separated and kinematically isolated from the at least one instrument.

Fischell is seen to be generally directed to a *passive* cooling system. Specifically, Fischell discloses a satellite having heat producing electronic equipment (16), a heat pipe (18–20), and a radiator element (21). *See* Fischell, col. 2, ll. 16–39 and Fig. 1. As disclosed in Fischell, a heat pipe is a *passive* cooling system:

In all of the embodiments satellite temperature control is actually effected by the conduction of vaporized liquid from the heated end portion of the pipe to the cooler end portion thereof, the vaporized liquid being condensed in said cooler end portion and returned, by a wick, to the heated end portion for re-vaporization.

Fischell, col. 2, ll. 9-15. This conventional heat pipe, which relies upon the *passive* heat transfer of a dual phase fluid, is unlike the present invention, in which the cooling system includes an active cooler tending to generate vibrations. For example and without limitation, various embodiments of the present invention utilize single- or multiple-stage, pulse tube or Stirling cycle cryocoolers which include compressors that generate vibration. Accordingly, as the passive cooling system in Fischell does not and can not generate vibration, Fischell does not disclose an active cooler tending to generate vibrations, and therefore does not disclose and can not suggest any kinematic isolation or kinematic mounts. Indeed, as the Office Action indicates on page 2, "Fischell is silent on the kinematic mount to kinematically isolate the instrument from the other parts of the spacecraft." Applicants wholeheartedly agree, as the heat producing electronic equipment (16) in Fischell is seen to be placed within and attached to the walls (11-13) of the satellite, to which the heat pipe (18) is also attached, without any suggestion or indication of a kinematic mount or kinematic isolation.

Accordingly, Fischell is not seen to disclose or suggest the features of independent Claims 1 and 22, particularly with respect to at least the features of (i) at least one active cooler tending to generate vibrations, (ii) at least one kinematic mount for kinematically isolating the at least one active cooler from the at least one instrument and (iii) the at least one active cooler mounted or for being mounted at a location spatially separated and kinematically isolated from the at least one instrument.

Simonian is not seen to remedy the above deficiencies of Fischell. Simonian is seen to be generally directed to a damped kinematic mount for supporting an instrument. Specifically, Simonian discloses a kinematic instrument mount that includes dampers and flexures. *See* Simonian, col. 3, ll. 42-25; col. 4, ll. 24-30. The kinematic mount in Simonian is for isolating the *instrument* from unpredictable moment loads due to the spacecraft interface and different thermal expansion rates. *See* Simonian, col. 3, ll. 19-21. This is unlike the present invention, in which the kinematic mount is for kinematically isolating the active *cooler* from the instrument. Nowhere is Simonian seen to disclose, teach or suggest (i) at least one active cooler tending to generate vibrations, (ii) at least one kinematic mount for kinematically isolating the at least one active cooler from the at least one instrument and (iii) the at least one active cooler mounted or for being mounted at a location spatially separated and kinematically isolated from the at least one instrument.

Schulte is not seen to remedy the above deficiencies of Fischell and Simonian. Schulte is seen to be generally directed to a shock absorber system. Specifically, Schulte discloses a system including two spring and damper support members attached to the top of an object and four such members attached to the bottom for supporting the object against shocks. *See Schulte, Abstract.* Nowhere is Simonian seen to disclose, teach or suggest (i) at least one active cooler tending to generate vibrations, (ii) at least one kinematic mount for kinematically isolating the at least one active cooler from the at least one instrument and (iii) the at least one active cooler mounted or for being mounted at a location spatially separated and kinematically isolated from the at least one instrument.

The Office Action indicates that “[i]t would have been obvious to one of ordinary skill in the art to have used kinematic mounts in Fischell’s system as taught by Simonian or Schulte to prevent unwanted vibrations.” As previously indicated, Fischell does not disclose active coolers, and is therefore not concerned with vibrations or kinematically isolating active coolers.

Accordingly, there is no motivation or suggestion to combine the *passive* satellite cooling system of Fischell (which generates no vibrations) with the kinematic mounts of Simonian or Schulte. Applicants respectfully submit that since there is no motivation or suggestion to make such a combination, such a combination can only be made based on impermissible hindsight in view of Applicants’ own disclosure. Even assuming, *arguendo*, that such a combination were made, however, merely combining the *passive* cooling system of Fischell with a kinematic mount of Simonian or Schulte would not provide the thermal control system of the present invention, which includes an *active* cooler tending to generate vibrations not disclosed in any of these references.

Feger, Gelon and Caplin, which were used in the rejection of certain dependent claims, are not seen to remedy the above deficiencies of Fischell, Simonian and Schulte. Feger is seen to be generally directed to a thermal link. Specifically, Feger discloses a thermal link device for use between a cryogenic machine and a load. *See Feger, Abstract.* Gelon is seen to be generally directed to a thermal radiative system. Specifically, Gelon discloses a shield including phase change management material thermally connected to a thermal load for drawing heat away therefrom. *See Gelon, Abstract.* Caplin is seen to be generally directed to equally distributing heat dissipation between multiple radiators of a satellite. Specifically, Caplin discloses a thermal distribution device including loads capable of inhibiting current from adjacent power sources and

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accepting current only from nonadjacent power sources. *See Caplin, Abstract.* Nowhere are Feger, Gelon or Caplin seen to disclose, teach or suggest (i) at least one active cooler tending to generate vibrations, (ii) at least one kinematic mount for kinematically isolating the at least one active cooler from the at least one instrument and (iii) the at least one active cooler mounted or for being mounted at a location spatially separated and kinematically isolated from the at least one instrument.

Accordingly, the applied references are not seen to disclose, teach or suggest the combination of features of amended independent Claims 1 and 22, which are believed to be in condition for allowance.

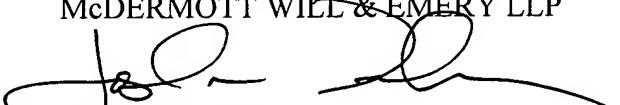
The other claims currently under consideration in the application are dependent from independent Claims 1 and 22 discussed above and therefore are believed to be allowable over the applied references for at least the same reasons. Because each dependent claim is deemed to define an additional aspect of the invention, however, the individual consideration of each on its own merits is respectfully requested.

In view of the foregoing amendments and remarks, the entire application is believed to be in condition for allowance and such action is respectfully requested at the Examiner's earliest convenience.

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Respectfully submitted,

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